Appendix N

Overview of DOE Nationwide and Hanford Site Waste Management Programs and Initiatives

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The following sections describe the U.S. Department of Energy (DOE) national waste management programs, the implementation of those programs at Hanford, and recent initiatives examining strategies to accelerate cleanup activities

N.1 DOE Nationwide Waste Management Programs

DOE nationwide waste management programs fall into two general categories: 1) management of operational waste generated during other research and materials production programs, and 2) environmental restoration programs to clean up and close DOE facilities that no longer have active operations. Management of operational waste has been evaluated in the *Final Waste Management Programmatic Environmental Impact Statement for Managing Treatment, Storage, and Disposal of Radioactive and Hazardous Waste* (WM PEIS, DOE 1997a) and the *Waste Isolation Pilot Plant Disposal Phase Final Supplemental Environmental Impact Statement* (WIPP SEIS 2, DOE 1997c), as described in Section 1, in Volume I of this HSW EIS. Environmental restoration activities generally fall under the authority of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 (42 USC 9601). Under DOE policy (DOE 1994a), the CERCLA process incorporates values and public involvement procedures comparable to those implemented by the National Environmental Policy Act (NEPA, 42 USC 4321). The following sections describe the DOE nationwide activities to manage both operational and environmental restoration wastes and other nuclear materials.

N.1.1 Environmental Management Top-to-Bottom Review

In 2001, DOE reviewed its efforts to clean up 114 sites nationwide that are managed as part of DOE's Environmental Management (EM) Program (DOE 2002b). Cleanup of 74 of those sites is complete, and cleanup efforts at other sites are well underway. However, costs and schedules for the more extensive cleanup efforts, including Hanford, were expected to increase unless there were major changes in the way cleanup work was being managed. That review, referred as the Top-to-Bottom Review, was intended to identify problems and recommend improvements to accelerate cleanup, reduce risks, and reduce costs.

Twelve major issues were identified during the review:

1) Better use of performance-based contracting is needed. Performance-based contracting is the single best opportunity for improving DOE's cleanup efforts. It is now being employed inconsistently. This inconsistency reduces the effectiveness of this contracting approach to reduce risks to workers, the public, and the environment. Better use of performance-based contracting requires improvements by both DOE and its contractors.

2) Waste needs to be managed to reduce risks. The current framework and, in some cases, interpretation of DOE Orders and requirements, laws, regulations, and cleanup agreements create obstacles to achieving cleanup that reduces risks to workers, the public, and the environment as quickly as possible. Waste is often managed and treated based on where it comes from and not on what actual risk it presents to workers, the public, and the environment. Funds are not being spent in proportion to the hazards.

3) Cleanup strategies for accelerating site closure need to be based on national needs. There is no single strategy for closure of DOE sites. There is only a collection of closure strategies for individual sites. This fragmented approach results in costly duplication of effort and assignment of priorities based on local concerns rather than on a national basis.

4) Cleanup agreements need to be improved. Regulatory agreements have often failed to achieve expected reductions in risk or accelerated site closures. In some cases, provisions in these agreements have not focused on the highest risk.

5) Safeguard and security threats need to be reduced. Large quantities of special nuclear materials are stored at several facilities that have no need for those materials. A great deal of combustible and dispersible transuranic waste is also stored at many sites awaiting certification and disposal. These scattered storage configurations are difficult to manage, expensive, and present greater safeguards and security concerns.

6) Long-term stewardship needs to be better considered. Long-term stewardship is necessary for the continued protection of the public and the environment after sites are closed. DOE needs to adequately plan for long-term stewardship at these sites.

7) Breakthrough business processes are needed to accelerate risk reduction. DOE's existing business processes are not structured to address cost and schedule growth. As structured today, the cleanup of DOE's EM sites is expected to cost $220 billion. This cost could increase to over $300 billion unless significant changes are made. With increased cost come further delays in cleanup.

8) Implementation of NEPA requirements needs to better support decision making. The NEPA process as currently implemented for clean up efforts is often time-consuming and costly without providing the sound analysis and rational alternatives needed to support good decision making by DOE.

9) A single program for accelerating clean up of small sites is needed. DOE's EM Program is responsible for the cleanup of several small sites. Cleanup of those sites could be accelerated and life-cycle costs reduced if a single management approach were used to address those cleanup efforts.

10) Packaging and transportation requirements need to better support accelerated risk reduction. Existing packaging and transportation policies and procedures often result in delays in removing materials from sites. This increases costs and delays reduction of risks.

11) Environmental Management Program needs to focus on cleanup. DOE's EM Program manages several activities that do not support accelerated, risk-based clean up. Both budget resources and staff and management attention are not fully applied to clean up and closure of sites.

12) Science and Technology Program needs to focus on cleanup efforts. DOE's Science and Technology Program is not focused on providing the necessary support to DOE's EM Program to accelerate clean up efforts.

N.1.2 DOE Cost Report

In 2002, DOE prepared a life-cycle cost analysis to address the disposal of DOE's LLW (DOE 2002c). Life-cycle disposal costs include those related to transportation, disposal, closure, and long-term stewardship. The report discussed facilities for the disposal of LLW from cleanup actions under CERCLA (e.g., the Environmental Restoration Disposal Facility [ERDF]) as well as facilities used for other LLW disposal (e.g., the LLBGs). The report was prepared to address congressional concerns regarding the cost of LLW disposal, the extent to which DOE fee structures reflect actual life-cycle costs, and the impact of DOE disposal facilities on commercial LLW disposal.

The report concluded the following:

1) Pre-disposal costs offer the greatest opportunity for cost savings.

   Pre-disposal costs are those costs associated with getting LLW ready for disposal, packaging LLW, and transporting LLW to a disposal site. Pre-disposal costs vary greatly by individual waste stream. These pre-disposal costs are strongly influenced by specific radioactive constituents in the waste, the physical form of the waste, where the waste is generated, where it is disposed of, and the volume of the waste.

2) DOE facilities used for the disposal of onsite waste from CERCLA cleanup actions offer the least expensive life-cycle disposal costs.

   LLW and MLLW from CERCLA cleanup actions tend to be very large volumes of minimally contaminated waste. This waste generally does not require special shielding or packaging to protect people or the environment. Costs can be spread over a greater volume of waste, thereby decreasing the per unit disposal cost of that waste. Disposal typically occurs at the same site as cleanup, thus minimizing transportation costs.

3) Commercial facilities offer the most cost-effective disposal for some DOE waste.

The report noted that commercial disposal facilities sometimes offer the lowest life-cycle disposal costs. This validates existing DOE practices. Commercial disposal facilities have historically been used for the disposal of some DOE LLW (DOE 1997b). Commercial disposal facilities will continue to be used by DOE where they offer cost-effective disposal of DOE LLW.

Envirocare of Utah, Inc. is the commercial site that currently receives the largest volume of DOE LLW. More than 20 DOE sites have disposed of large amounts of waste at the Envirocare site. For example, in September 2000, about 4200 m^3 (150,000 ft^3) of LLW from the DOE Savannah River Site were disposed of at Envirocare (Envirocare 2000c). DOE MLLW is also disposed of at Envirocare. For example, over a five-year period ending in 2000, the DOE-Oak Ridge Reservation shipped over 5600 m^3 (200,000 ft^3) of MLLW to Envirocare for disposal (Envirocare 2000a). Since 1993 Envirocare has received over 56,000 m^3 (2,000,000 ft^3) of DOE mixed and low-level waste for treatment and/or disposal (Envirocare 2000b).

4) DOE disposal facilities offer services that are not commercially available.

Some DOE LLW and MLLW cannot be disposed of at commercial facilities. Commercial disposal facilities operate under State or U.S. Nuclear Regulatory Commission licenses that restrict the sources, quantities, types, and specific characteristics of waste that can be disposed of in those facilities. DOE waste that cannot be disposed of commercially needs to be disposed of in DOE facilities.

5) Comparison of disposal alternatives must consider more than just disposal fees.

DOE LLW disposal sites charge fees to DOE waste generators for the incremental cost of facility operation and maintenance associated with waste disposal. DOE disposal sites are limited in their ability to charge fees to recover past costs (e.g., initial facility construction) that were funded through congressional appropriations. DOE is also precluded from collecting fees to cover future costs (e.g., closure and long-term stewardship) without specific congressional approval.

The way DOE funds disposal does not preclude life-cycle cost considerations being used to determine the most cost-effective disposal site. Given that pre-disposal costs offer a substantial opportunity for cost savings, the cost report concludes that DOE should continue to make disposal decisions based on life-cycle disposal costs rather than on the fees charged to DOE waste generators by DOE disposal sites. This recommendation reinforces existing DOE requirements for considering life-cycle costs, such as those for waste minimization (DOE 2001a), facility management (DOE 1998), and radioactive waste management (DOE 2001b).

N.2 DOE Office of Environmental Management Programs at the Hanford Site

The following sections describe EM activities at Hanford, and relates those activities to the alternatives described in this HSW EIS.

N.2.1 Spent Nuclear Fuel

As part of the defense materials program, spent nuclear fuel (SNF) from Hanford's production reactors was sent to process facilities, such as the Plutonium-Uranium Extraction (PUREX) Facility, to separate plutonium and uranium from the remaining radionuclides in the fuel. Most of the remaining radionuclides were sent to underground tanks in the Hanford 200 Areas for storage as HLW.

When the last processing plant closed in the late 1980s, about 2100 metric tons of unprocessed production reactor SNF remained at the Hanford Site. This SNF represents about one-eighth (1/8) of the curies of radioactivity that exist at Hanford. The SNF has been stored in the K Basins near the Columbia River. The K Basins are water-filled pools that provide shielding and cooling. Water in the K Basins contains small quantities of radioactive materials, and the basins have leaked water to the surrounding soil in the past.

Because of concerns about possible future contamination of the Columbia River, DOE is moving the SNF away from the river to a storage facility in the central Hanford Site. After the SNF is removed from the K Basins, it is dried in the Cold Vacuum Drying Facility and moved to the Canister Storage Building (CSB) in the 200 East Area. About 30 metric tons of SNF stored at other Hanford Site locations will also be sent to the CSB. The SNF would ultimately be sent to the Yucca Mountain repository for disposal.

After removal of the SNF, sludge (dirt and small debris) from the K Basins will be placed into sealed containers and sent to T Plant for storage. The sludge is classified as transuranic waste, which will be treated at Hanford and disposed of at WIPP. Contaminated water in the K Basins will be treated at the Effluent Treatment Facility (ETF), and the solid residues will be disposed of onsite. After the SNF, sludge and water have been removed, the K Basins will be demolished. The resulting debris and any surrounding contaminated soil will be disposed of at the LLBGs or ERDF.

As of January 2003, 957 metric tons of the 2100 metric tons of K Basin SNF had been sent to the CSB. Removal of all the SNF is scheduled for completion by 2004. Removal of the water and sludge, treatment of contaminated waste, and demolition of the K Basins is scheduled for completion by 2007.

N.2.2 High-Level Waste

After SNF was processed, the process waste was sent to underground tanks in the Hanford 200 Areas for storage. This process waste is defined as HLW, which consists of a combination of solids, sludges, and liquids. One hundred seventy-seven HLW tanks were constructed at Hanford and currently contain about 53 million gallons of waste.

Twenty-eight of the 177 Hanford tanks are double-shell tanks. The remaining tanks are single-shell tanks, of which 67 may have leaked more than one million gallons of waste. Liquids are being pumped from the single-shell tanks and transferred to double-shell tanks to prevent leaks from reoccurring. About 2.5 million gallons of liquid have been pumped from 131 single-shell tanks, and DOE plans to pump an additional 500,000 gallons out of the single-shell tanks by 2004.

Cesium and strontium were removed from HLW because of the heat generated during decay of those isotopes, and because of their potential for use in various industrial processes. The separated cesium and strontium were sealed in double-walled steel capsules that are currently stored in a water-filled pool at the Waste Encapsulation and Storage Facility (WESF). High-level tank waste and the cesium and strontium capsules, represent more than three-fourths of the curies of radioactivity that exist at the Hanford Site.

A waste treatment plant (WTP) is currently under construction at Hanford to treat and vitrify the tank waste, a process that will convert it to a stable glass for disposal. In the WTP, the tank waste will be separated into HLW and low-activity waste streams. The HLW glass will be placed into canisters and stored onsite before being sent to Yucca Mountain for disposal. DOE initially planned to store vitrified low-activity waste in concrete vaults in the 200 East Area (DOE and Ecology 1996). Other options for onsite disposal of the immobilized low-activity waste (ILAW) are being evaluated as part of this revised draft HSW EIS. DOE has also announced plans to prepare an EIS for retrieval of the tank waste and closure of the HLW tanks (68 FR 1052).

N.2.3 Environmental Restoration Waste

In 1989, portions of the Hanford Site were placed on the National Priorities List as contaminated sites requiring cleanup action under CERCLA. CERCLA provides the regulatory framework for most cleanup of potentially hazardous materials from past-practices sites, such as old buildings, waste cribs, burial grounds, and other sites that are no longer in use. CERCLA provides a process to address sites where a release, or a threat of release, of hazardous substances has occurred. In the context of CERCLA, remediation of a waste site may consist of removing the hazardous materials and other contaminated materials from the waste site, or it could involve a combination of removal and stabilization of the site to minimize migration of residual hazardous materials to the surrounding environment (for example, by placing a barrier over the waste site to reduce water infiltration and migration of the waste constituents to groundwater).

CERCLA and the National Contingency Plan regulations (40 CFR 300) provide authority for conducting two types of response actions: removal actions and remedial actions. Removal actions are applied to cases that do not require extensive, time-consuming, and costly study and analysis. Removal actions can also be taken to respond to emergencies, address entire operable units, or achieve prompt risk reduction prior to a remedial response. In many instances, it may be reasonable to complete the cleanup entirely using only removal authorities. A major goal of DOE removal actions is to contribute to the efficiency of any subsequent longer-term remedial actions. In cases where there has been a release, or threat of release, the factors outlined in 40 CFR 300.415(b) are considered in determining the appropriateness of taking a removal action.

For remedial actions, DOE conducts a remedial investigation/feasibility study to characterize the hazardous materials associated with each site and to consider potential methods for reducing the risk associated with those materials. The process for evaluating remediation alternatives includes comparing each alternative against nine criteria, including overall protection of human health and the environment, long-term effectiveness, and short-term effectiveness. As noted previously, these criteria address many of the same elements that would be addressed in a NEPA review. Long-term effectiveness considers the magnitude of the residual risk to human health or the environment from untreated waste, or treatment residues, remaining at the conclusion of remediation activities. It also considers the adequacy and reliability of controls needed to manage untreated wastes or treatment residuals. Short-term effectiveness evaluates impacts occurring during remediation, such as risks to the community (for example, from air emissions), risks to workers, and risks to the environment. A public review of the proposed action is included, ultimately leading to a CERCLA Record of Decision (ROD) for completing the remediation process.

Environmental restoration at Hanford involves characterizing and remediating contaminated soil and groundwater; stabilizing contaminated soil; remediating disposal sites; decontaminating, decommissioning, and demolishing former plutonium production buildings, nuclear reactors, and separation plants; maintaining inactive waste sites; transitioning facilities into the Surveillance and Maintenance Program; and mitigating effects to biological and cultural resources from site development and environmental cleanup and restoration activities. Within the Hanford Site, over 1700 waste sites and 500 contaminated facilities have been identified for remediation under CERCLA or a substantially comparable Resource Conservation and Recovery Act (RCRA) past-practices process. DOE has prioritized Hanford cleanup to focus on sites near the Columbia River first, including placing the plutonium production reactors into interim safe storage, demolition of other unneeded facilities, removal of contaminated soil, and remediation of inactive disposal facilities that contain potentially hazardous waste.

Nine plutonium production reactors were constructed at Hanford from 1943 through 1963. These reactors are being placed in interim safe storage , which is the process of demolishing all but the shield walls surrounding the reactor core and putting a new roof over the remaining facilities. The reactors will remain in the interim safe storage state for up to 75 years to allow radiation levels in the reactor cores to decay to more manageable levels. The first reactor interim safe storage project was completed in 1998, work is in progress on four others, and three remain to be started. Alternatives to dismantlement are being considered for B Reactor because of its historic role, including its preservation as a museum.

Most cleanup of the Hanford Central Plateau is planned after completion of the River Corridor activities, although some projects are currently in progress. That phase of the cleanup will include remediation of contaminated soil and inactive disposal facilities and disposition of inactive facilities, including the fuel and plutonium processing buildings. CERCLA sites in the 200 Areas, including burial grounds closed before 1970, are the last sites scheduled for a major characterization effort. DOE has undertaken a project that includes characterization to assess the nature and extent of soil contamination and to select appropriate remedial actions. Decisions regarding remediation would be made as characterization is completed. The framework for the characterization and remediation of 200 Area CERCLA sites is defined in the *200 Areas RI/FS Implementation Plan* (DOE-RL 1999).

The Environmental Restoration Disposal Facility (ERDF) is located in the center of the Hanford Site between the 200 East and 200 West Areas. ERDF is a large-scale disposal facility designed to receive and isolate LLW and MLLW. It is currently authorized by the U.S. Environmental Protection Agency (EPA) to receive only waste from Hanford cleanup activities. ERDF is a RCRA-compliant landfill authorized under CERCLA.

ERDF is designed to provide disposal capacity for projected Hanford cleanup wastes over the next 20 to 30 years. Four disposal cells make up ERDF. The first two cells were constructed beginning in 1995 and began receiving waste in 1996. The cells are each 152 meters (500 feet) square at the bottom, 21 meters (70 feet) deep, and over 304 meters (1,000 feet) wide at the surface. Construction of two additional cells was completed in 2000, and there are plans to construct up to four additional cells. The cells are lined with a RCRA Subtitle C-type liner and have a leachate collection system. An interim cover has been placed over filled portions of the first two cells. After ERDF is filled, a final barrier will be placed over the entire facility to minimize infiltration of rain and release of hazardous constituents from the waste. Capacity of the current four-cell configuration is 10 million tons, which can be expanded as necessary. Currently, ERDF receives about 3,000 tons of waste per day, and is expected to receive about 7 million tons of waste during Hanford cleanup. The facility is monitored regularly and will continue to be monitored after closure to ensure that human health and the environment are protected.

N.2.4 Groundwater Protection

Groundwater beneath the Hanford Site ultimately surfaces at springs near or in the Columbia River, which traverses the northern and eastern parts of the site. Some of the groundwater is contaminated by radionuclides and hazardous chemicals as a result of past liquid disposal practices, leaks, and spills. Past practices that contributed to groundwater contamination have been discontinued, including disposal of untreated liquids to the ground. Programs are underway to clean up and stabilize remaining materials that could present a threat to human health and the environment. Ongoing radioactive and hazardous waste management practices comply with applicable standards, and they are evaluated on a continuing basis to minimize environmental degradation.

DOE conducts an extensive program to monitor groundwater contamination (Poston et al. 2002). In 2001, samples were collected from 735 monitoring wells to determine the distribution and movement of existing radiological and chemical constituents in Hanford Site groundwater and to identify and characterize potential and emerging groundwater contamination problems. Samples were analyzed for approximately 40 different radiological constituents and 290 different chemical constituents. The total area of groundwater contaminant plumes with concentrations exceeding drinking water standards was estimated to be about 208 square kilometers (80 square miles) in 2001. This area, which has decreased by about 1% compared to 2000, occupies approximately 14% of the total area of the Hanford Site. Most of the contaminant plume area, represented by tritium, lies southeast of the 200 East Area extending to the Columbia River.

The most widespread groundwater contaminants are tritium, iodine-129, technetium-99, uranium, strontium-90, carbon tetrachloride, nitrate, and trichloroethene. Plumes of carbon-14, cesium-137, cobalt-60, and plutonium occur in isolated parts of the 100 and 200 Areas. For the last 10 years, DOE has been treating contaminated groundwater plumes in both the 100 and 200 Areas to reduce potential hazards to downstream populations and the environment. Since the pump-and-treat projects began, over 4 billion liters of groundwater have been treated. Nearly 300 kg of chromium, over 6,000 kg of carbon tetrachloride, 20,000 kg of nitrate, 130 kg of uranium, 80 g of technetium-99, and 1.1 Ci of strontium-90 have been removed. An additional 77,000 kg of carbon tetrachloride has been removed from the soil by vapor extraction to prevent future groundwater contamination (Poston et al. 2002).

Groundwater monitoring at Hanford is being addressed under milestones established under the Tri Party Agreement independently of this HSW EIS. DOE and a team of contractors have developed, and are implementing, a sitewide program that integrates all assessment and remediation activities that address key groundwater, vadose zone, and related Columbia River issues. This effort is coordinated by the Groundwater Protection Program to support cleanup and closure decisions for the Hanford Site and protection of the Columbia River. Information developed under that program was used to evaluate long-term impacts of LLW and MLLW disposal in this revised draft HSW EIS. Additional information can be found at http://www.bhi-erc.com/projects/vadose.

N.2.5 Liquid Waste

The 200 Area Liquid Waste Processing Facilities receive, treat, and dispose of liquid effluents from onsite programs and projects. Facilities include the Liquid Effluent Retention Facility (LERF), the 2025E Effluent Treatment Facility (ETF), the 200 Area Treated Effluent Disposal Facility (TEDF), State-Approved Land Disposal Site (SALDS), and the 242-A Evaporator. The 300 Area TEDF processes potentially hazardous wastewater from the 300 Area.

The 242-A Evaporator is a RCRA-permitted facility that concentrates tank waste to reduce the overall volume and storage requirements. The facility has a volume reduction capacity of 270,000 L (70,000 gal) per day. The concentrated waste is returned to the waste tanks, and the process condensate is transferred to the LERF. Since the evaporator was upgraded in 1994 and from its restart through late 2000, its operation has reduced tank waste volume by over 11 million gallons. This treatment activity has provided a savings in tank space equivalent to 12 double-shell tanks.

The LERF is a RCRA-permitted facility that consists of three basins with a usable capacity of about 88 million L (23 million gal). The LERF receives and temporarily stores wastewater from the 242-A Evaporator, groundwater from the site pump-and-treat projects, leachate from onsite solid waste disposal facilities and a variety of generators (including site cleanup activities). From LERF, the water is routed to the ETF for treatment and disposal.

The ETF is a RCRA-permitted treatment process, has a design capacity 216 million L (56 million gal) per year, and removes hazardous and radioactive contaminants other than tritium. The ETF treatment process includes filtration (removal of suspended solids) ultraviolet light/peroxide (destruction of organics), reverse osmosis (removal of dissolved solids), and ion exchange (radioactivity removal). Storage tanks hold the treated effluent for verification of acceptable discharge levels, before the effluent is transferred to the 200 Area TEDF or SALDS.

The 200 Area TEDF is a collection and disposal system for non-hazardous, non-radioactive waste streams. The TEDF includes more than 19 kilometers (12 miles) of polyvinyl chloride pipe up to 36 centimeters (14 inches) in diameter connecting facilities to a second state-permitted land disposal site. The TEDF has a capacity of 13,000 L (3,400 gal) per minute, equivalent to 6.8 billion L (1.8 billion gal) per year. The final disposition of this waste is the SALDS.

The SALDS receives treated and verified liquid process waste from the 200 Area TEDF. The liquid wastes received at SALDS are not considered dangerous, but may contain small quantities of tritium. The facility consists of a gravel bed with a geotextile membrane cover.

The 300 Area TEDF receives the combined wastewater collection for the 300 Area. The facility receives processed wastewater and has the ability to perform characteristic waste treatment under Permit-by-Rule provisions.

N.2.6 Cleanup, Constraints, and Challenges Team (C3T)

In 2001, the DOE, its contractors, the EPA, and the Washington State Department of Ecology started a series of discussions to better identify, characterize, and resolve constraints and barriers to Hanford cleanup (DOE-RL 2002a). These discussions, referred to as the Cleanup, Constraints, and Challenges Team (C3T) process, are designed to be an informal forum where ideas and concepts could be discussed openly. Ideas are developed and evaluated to determine whether they could accelerate cleanup; reduce costs; or protect workers, the public, and the environment. The C3T process is not intended to replace legal or regulatory requirements, or to change formal commitments such as the Tri-Party Agreement (TPA). Some concepts identified during the C3T process might be suitable for implementing immediately. However, most would probably require further planning, changes to existing permits and TPA Milestones, changes to existing contracts, and preparation of additional NEPA reviews.

Seven sub-teams were formed to consider opportunities to accelerate cleanup and reduce cost in the following areas:

1) <u>Cesium/Strontium Capsule Disposition</u>:
    - Develop options that would substitute continued underwater storage of cesium and strontium capsules.
    - Develop options that would substitute vitrifying cesium and strontium prior to final disposal.

2) <u>Tank Retrieval and Closure Demonstration Project</u>:
    - Demonstrate waste retrieval technologies.
    - Demonstrate closure of tanks.

3) <u>ORP (DOE Office of River Protection) Baseline Opportunities (Mission Acceleration Initiatives)</u>:
    - Enhance design and operations of the waste treatment plant (WTP).
    - Explore alternate waste treatment technologies including sulfate removal, containerized grout, bulk vitrification, and steam reformation.

4) Integrated Groundwater Protection, Monitoring, Assessment, and Remediation:
   - Develop an overall approach for groundwater protection, monitoring, assessment and remediation.
   - Explore technologies for removing and immobilizing contaminants.
   - Reduce natural and artificial recharge through contaminated areas.
   - Minimize duplication and inconsistencies between regulatory requirements for monitoring and well drilling (RCRA, CERCLA, U.S. Atomic Energy Act [AEA]) and comply with standards for protection of human health and the environment.

5) Central Plateau Vision and Strategy:
   - Develop an overall approach to cleanup of waste sites on the Central Plateau.
   - Develop a strategy for transitioning the Central Plateau to industrial use.

6) Waste Disposal Project Options:
   - Consider combined disposal of LLW, MLLW, and ILAW.
   - Evaluate the use of canyon buildings for waste disposal.
   - Coordinate pre-1970 and post-1970 transuranic waste management activities (retrieval, treatment, disposal).

7) ORP (DOE-Office of River Protection)/RL (DOE-Richland Operations Office) Baseline Integration and Infrastructure Optimization (Site Infrastructure and Services):
   - Assess site infrastructure needs (e.g., roads, utilities) as cleanup progresses and the Hanford Site "shrinks."

N.2.7 Hanford Performance Management Plan (HPMP)

Drawing on recommendations contained in the Top-to-Bottom Review and from ideas emerging from the C3T process (DOE-RL 2002a), the Hanford Performance Management Plan (HPMP) was prepared to accelerate cleanup at Hanford (DOE-RL 2002b). The HPMP describes higher-level strategic initiatives as well as specific goals for completing Hanford cleanup by 2035, which is 35 years earlier than previously planned.

A Hanford map showing the River Corridor, the Central Plateau, and some key features on the Hanford Site is shown in Figure N.1.

With the help of the EPA and the Washington State Department of Ecology, six strategic initiatives were developed:

1) Accelerate Columbia River Corridor Cleanup. Restore the Columbia River Corridor reducing the risk to the river and shrinking Hanford Site operations. Complete remediation of 50 burial grounds, 579 waste sites, 357 excess facilities, and 7 plutonium production reactors by 2012.

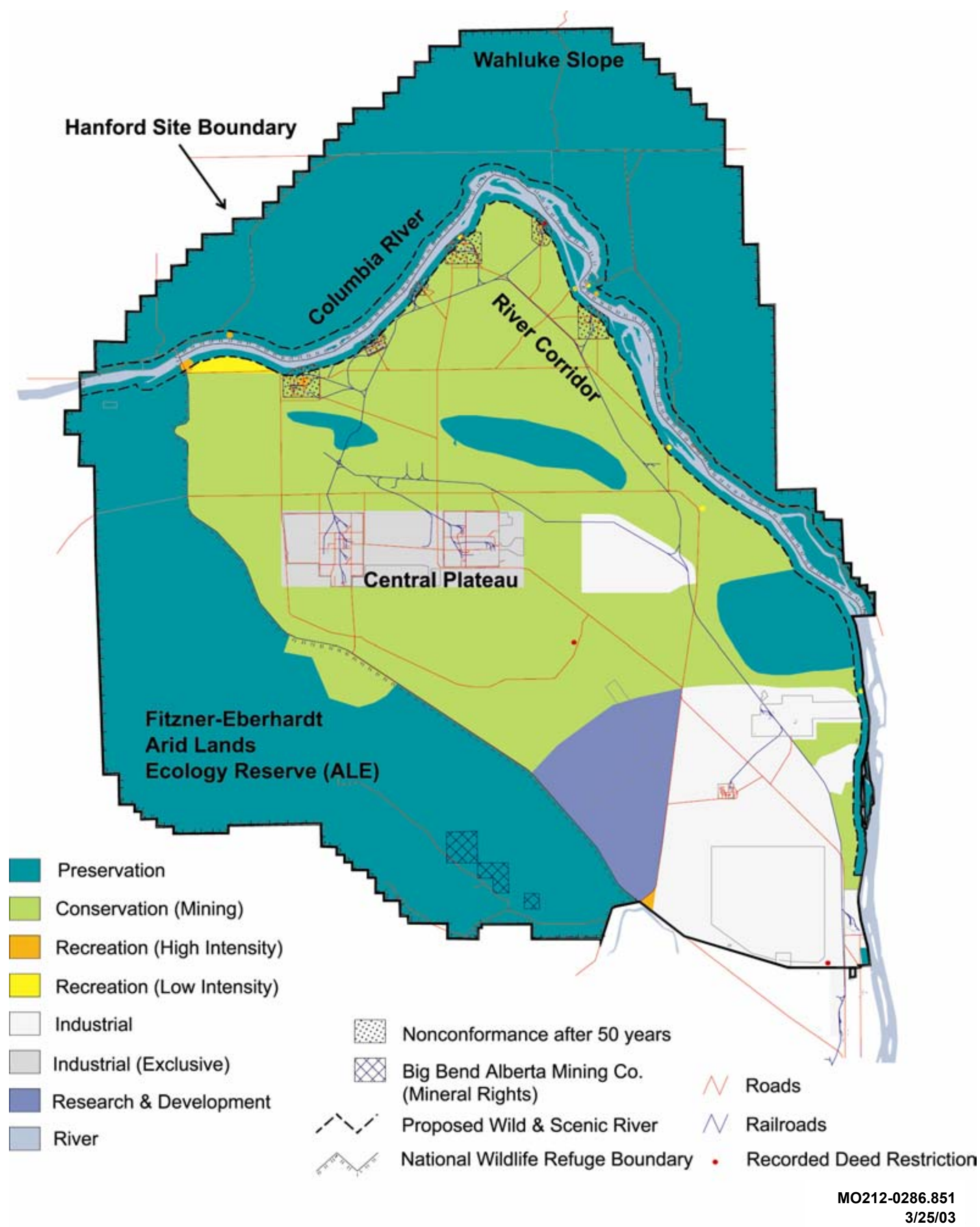

Figure N.1. Hanford's Land-Use Plan

2) Accelerate Tank Waste Treatment. End the tank waste program by 2033. Accelerate tank waste retrieval. Complete tank waste treatment by 2028 by increasing the capacity of the planned Waste Treatment Plant and using supplemental technologies for waste treatment and immobilization. Demonstrate tank closure and start in earnest the process of closing tanks now. Many of the activities related to tank waste are on the "critical path" to site closure, and the site cannot be closed until they are complete.

3) <u>Accelerate Stabilization and De-Inventory of Nuclear Materials.</u> Accelerate the cleanup of Hanford's other urgent risks. Remove K Basins spent nuclear fuel, sludge, debris, and water from the river's edge 10 months early. Stabilize and securely store remaining plutonium nine years sooner. Demolish the Plutonium Finishing Plant (PFP) seven years earlier. Evaluate the benefits of moving 1,936 high-radiation-level cesium and strontium capsules to a secure dry storage facility and seek a path to allow Hanford to directly ship the (unvitrified) capsules to a national geologic repository. This would avoid the risk, time and cost associated with vitrifying the capsules in the Waste Treatment Plant.

4) <u>Accelerate Waste Disposal.</u> Accelerate treatment and disposal of MLLW and retrieval and shipment of TRU waste five to ten years ahead of current plans. Work with other DOE sites to ensure that disposal capability exists to meet their mission and closure schedules.

5) <u>Accelerate Central Plateau Cleanup.</u> Use regional or other waste site grouping strategies to clean up over 900 excess facilities on the Central Plateau (including the five massive plutonium separation and processing facilities commonly referred to as canyons) and more than 800 non-tank-farm waste sites. Use U Plant to demonstrate the ability to combine disposition canyon facilities in place (the Canyon Disposal Initiative) and remediate associated waste sites. With the exception of T Plant, which is required for final processing, disposition of the canyon facilities is expected 14 years early.

6) <u>Accelerate Cleanup and Protection of Hanford Groundwater.</u> Protect groundwater resources. Remove or isolate contaminant sources on the Central Plateau. Remediate sources of contamination outside the Central Plateau core zone. Reduce the conditions that have the potential to drive contaminants into the groundwater. Integrate all site monitoring requirements. Accelerate remediation of high-risk sites by five years.

A list of specific goals and how they compare to previous plans can be found in Table N.1.

Under HPMP initiatives, cleanup of 964 km^2 (511 mi^2) of the Hanford Site's 1158 km^2 (586 mi^2) would be complete by 2012. After that time, cleanup activities would be limited to the Central Plateau. Acceleration is expected to reduce the estimated \$90 billion cleanup costs by \$30-40 billion.

While all the strategic initiatives affect Hanford as a whole, activities included in Strategic Initiative 4, Accelerate Waste Disposal, are most relevant to the alternatives analyzed in the HSW EIS. Specific goals within that initiative include the following:

- Initiate retrieval of buried, suspect transuranic waste by April 30, 2003.

- Initiate construction of lined MLLW/LLW disposal facilities by April 30, 2005.

- Complete characterization, retrieval, storage, and disposal of 15,000 drum-equivalents of suspect transuranic waste by September 30, 2006.

Table N.1. Hanford Performance Management Plan Acceleration Goals

Cleanup Activity	Previous Plan	Acceleration Goal
Complete Cleanup	2070	2035
Start Tank Closure	2012[a]	2002
Initiate Plutonium Finishing Plant (PFP) Plutonium Deinventory	2009	2003
Establish the Site-Wide Integrated Groundwater Protection Program	NA[b]	2003
Complete First Tank Waste Retrieval and Closure Demonstration	2014[a]	2004
Demonstrate Supplemental Tank Waste Technologies	NA	2004
Complete Plutonium Finishing Plant (PFP) Plutonium Deinventory	2014	2005
Retrieve, Assay, and Disposition 15,000 Drums of Buried Suspect Transuranic Waste	2010	2006
Complete Removal of K Basins Spent Nuclear Fuel, Sludge, Debris, and Water	2007[g]	2006
Move Cesium and Strontium Capsules into Dry Storage	NA	2008[c]
Treat 14,000 m^3 of Mixed Low-Level Waste	2012	2008
Demolish PFP	2016	2009
Achieve Waste Treatment Plant Full Performance	2018	2010
Complete U Plant Regional Closure	2025	2011
Initiate Shipments of Cesium and Strontium Capsules to National Geologic Repository	2040	2012
Complete River Corridor Cleanup	2037	2012[e]
Complete Remediation of High-Risk Sites[e]	2017	2012
Disposition All Contact-Handled Transuranic Waste[d]	2027	2015
Complete Closure of 60 to 140 Single-Shell Tanks[h]	2024	2018
Complete Tank Waste Treatment	2048[f]	2028

(a) The current Tri-Party Agreement target date.
(b) Agencies have recently agreed to establish a new sitewide Integrated Groundwater Protection Program.
(c) The benefits of dry storage and disposal options will be evaluated in FY 2003.
(d) Remote-handled and non-standard transuranic waste will require processing through a modified T Plant or a new facility, alternatives evaluated in this EIS.
(e) Several discrete projects in the River Corridor will not be completed by 2012. The 618-10 and 618-11 Burial Grounds will be completed in 2018. Several facilities in the 300 Area related to the Pacific Northwest National Laboratory will remain operational. The reactor cores will remain in interim safe storage pending final disposition. Ongoing groundwater cleanup, monitoring, and stewardship activities will be required based on final groundwater remedies. The Fast Flux Test Facility is not yet included.
(f) The current DOE projection is 2048. The Tri-Party Agreement date is 2028.
(g) The current Tri-Party Agreement Milestone is July 31, 2007.
(h) The number of tanks depicted here represents a DOE goal and does not represent agreement with the Washington State Department of Ecology.

- Complete risk studies and associated environmental documentation to support decisions about how much of the remaining post-1970 and pre-1970 transuranic waste must be retrieved by September 30, 2006.

- Initiate use of lined MLLW/LLW disposal facilities by September 30, 2007.

- Complete treatment and/or disposal of all stored mixed low-level waste (about 7000 m^3) and newly generated MLLW (forecasted to be about 7000 m^3) by September 30, 2008.

- Complete retrieval of post-1970 suspect, contact-handled transuranic waste from the Low Level Burial Grounds by September 30, 2010.

- Complete certification and shipment of all legacy, contact-handled transuranic waste (about 7500 m^3) to the Waste Isolation Pilot Plant by September 30, 2013.

Some of the acceleration activities described in the HPMP could be implemented immediately. Others could be implemented as a result of reviews performed under this HSW EIS. Some, however, would require further planning, changes to existing permits and TPA Milestones, and preparation of additional NEPA or CERCLA reviews. Implementation of some of the accelerated cleanup proposals is discussed in Volume I, Section 3 of this EIS. However, the plans and schedules associated with many HPMP proposals were not sufficiently well developed for detailed analysis at the time this EIS was prepared. Therefore, the analyses of environmental impacts presented in Section 5 do not necessarily reflect all activities, or the timing of some activities, as described in the HPMP.

N.2.8 Pollution Prevention/Waste Minimization

Pollution prevention is defined as the use of materials, processes, and practices that reduce or eliminate the generation and release of pollutants, contaminants, hazardous substances, and wastes into land, water, and air. Pollution prevention includes practices that reduce the use of hazardous materials, energy, water, and other resources along with practices that protect natural resources through conservation or more efficient use. Within DOE, pollution prevention includes all aspects of source reduction as defined by the EPA, and incorporates waste minimization by expanding beyond the EPA definition of pollution prevention to include recycling.

DOE's interpretation of pollution prevention is consistent with the definition in the International Organization of Standardization (ISO) Document 14001, *Environmental Management Systems – Specifications with Guidance for Use* (ISO 1996), which includes recycling. DOE's definition is also consistent with the Council of Environmental Quality's definition of pollution prevention.

Pollution prevention is achieved through the following:

- equipment or technology selection or modification, process or procedure modification, reformulation or redesign of products, substitution of raw material, waste segregation, and improvements in housekeeping, maintenance, training or inventory control

- increased efficiency in the use of raw materials, energy, water, or other resources

- recycling to reduce the amount of waste and pollutants destined for release, treatment, storage, and disposal.

Pollution prevention is applied to all DOE pollution-generating activities including the following:

- manufacturing and production operations

- facility operations, maintenance, and transportation

- laboratory research

- research, development, and demonstration

- weapons dismantlement

- stabilization, deactivation, and decommissioning

- legacy waste and contaminated site cleanup.

DOE is faced with the challenge of removing and treating wastes already generated from past production and manufacturing operations. Facility and equipment stabilization, deactivation and decommissioning, and weapons dismantlement activities result in significant amounts of wastes that must be handled. Many pollution prevention techniques may not directly apply to wastes that were generated and media that were contaminated by previous practices. However, two techniques, waste segregation and recycling, are used to reduce the amount of such waste that would otherwise require additional treatment and disposal.

Additional waste and pollutants are generated in the process of conducting restoration and dismantlement activities. Pollution prevention is applicable to the generation of secondary waste and is factored into remedial investigations, feasibility studies, design, and execution of all restoration and dismantlement projects. Restoration projects are performed in a manner that reduces or prevents the generation of new waste and pollutants, and reduces the further release and spread of contamination (DOE 1996b).

In 1994, DOE prepared its first pollution prevention plan (DOE 1994b). The latest version of DOE's Pollution Prevention Program is described in *Pollution Prevention Program Plan* (DOE 1996b). This plan is consistent with the requirements and guidance of the following:

- Pollution Prevention Act of 1990 (42 USC 13101)

- Resource Conservation and Recovery Act (42 USC 6901)

- Executive Order 13101, Greening of Government through Waste Prevention, Recycling, and Federal Acquisition (63 FR 49643, September 14, 1998)

- Executive Order 13123, Greening the Government through Efficient Energy Management (64 FR 30851, June 3, 1999)

- Executive Order 13148, Greening the Government through Leadership in Environmental Management (65 FR 24595, April 21, 2000)

- Executive Order 13149, Greening the Government through Federal Fleet and Transportation Efficiency (65 FR 24607, April 21, 2000)

- DOE Order 5400.1, Change 1, *General Environmental Protection Program* (June 29, 1990) (DOE 1990)

- DOE Order 430.2, *In-House Energy Management* (June 13, 2000) (This Order has been replaced by DOE Order 430.2A, *Departmental Energy and Utilities Management*, April 15, 2002) (DOE 1996a)

- DOE Notice 430.3, *Extension of DOE Order 430.2, In-House Energy Management*, (December 13, 2000) (This notice has been replaced by DOE Order 430.2A, *Departmental Energy and Utilities Management*, April 15, 2002) (DOE 1996a)

- DOE Order 435.1, *Radioactive Waste Management* (July 9, 1999) (This Order was supplemented by DOE Order 435.1, Change 1, August 28, 2001) (DOE 1999)

- DOE Manual 435.1, *Radioactive Waste Management Manual* (July 9, 1999) (This manual was supplemented by DOE Manual, Change 1, June 19, 2001) (DOE 2001a)

The *Pollution Prevention Program Plan* outlines specific goals issued by the Secretary of Energy for reducing waste generation from routine operations and for reducing the use and release of toxic chemicals. This plan required that individual operations offices, like the Richland Operations Offices that is responsible for Hanford activities, develop its own goals to help achieve the DOE-wide goals set by the Secretary. The *Pollution Prevention Program Plan* set goals through December 31, 1999. Further goals have since been set for fiscal year (FY) 2005 and 2010.

DOE's generation of all waste types, including LLW, MLLW, and transuranic waste has decreased substantially since 1993. This same trend in the reduction of wastes generated is also occurring at the Hanford Site. The reduction in waste generated by DOE during routine operations and during cleanup/stabilization activities has resulted in cost savings or avoidance of costs amounting to over $120,000,000 in FY 2001. Of that figure, more than $22,000,000 of cost savings and cost avoidance occurred at Hanford (DOE 2002a).

Some examples of waste minimization activities performed at Hanford during FY 2001 are provided below (extracted from DOE-RL 2001).

- Mechanical screening to separate contaminated soil from non-contaminated soil reduced the amount of soil that would have otherwise been sent to ERDF for disposal as LLW by almost 1400 m^3 and saved $192,000.

- Reusing lead from contaminated railcars in the 325 Building reduced the amount of lead that would have otherwise been treated and disposed of as MLLW by 2.1 m^3 and saved about $35,000.

- Upgrading the ion exchange system at the ETF will result in the reduction of the amount of MLLW that will be generated annually by 9.8 m^3 and will save about $38,000 annually.

- Recycling chemicals and gases; fire extinguishers; incandescent, sodium, and mercury vapor lamps; mercury and related equipment; shop towels; and small batteries reduced the amount of material that would have otherwise been treated and disposed of as hazardous waste by 8.5 tons and saved about $190,000.

- Recycling lead acid vehicle batteries reduced the amount of material that would have otherwise been treated and disposed of as hazardous waste by 8.5 tons and saved almost $200,000.

- Replacement of a high-performance liquid chromatograph and other laboratory equipment will result in the reduction of the amount of mixed low-level waste and hazardous waste that will be generated annually by about 0.1 m^3 and will save about $94,000 annually.

- Using slightly contaminated soil for shielding and mixing during remediation activities at the 100-N Crib reduced the amount of soil that would have otherwise been sent to ERDF for disposal as LLW by almost 3600 m^3 and saved about $450,000.

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